

ON SOME FRUCTIFICATIONS OF THE GLOSSOPTERIDALES FROM THE UPPER PERMIAN OF N.S.W.

W. B. K. HOLMES*

[Accepted for publication 23rd May 1973]

(Plates VI-VIII)

Synopsis

Fructifications referable to the Glossopteridales are described from the Upper Permian of New South Wales. They include *Austroglossa walkomii* gen. et sp. nov., a female gymnospermous fructification attached to a *Glossopteris conspicua* Feist. leaf; male fructifications, *Eretmonia cooyalensis* sp. nov., *Isodictyopteridium costatum* sp. nov. and *Dictyopteridium sporiferum* Feist. ex Zeiller. An unusual leaf type is noted.

INTRODUCTION

The material to be described was mostly collected by the author from a small quarry at Kane's Flat, near Cooyal, 29 km north-east of Mudgee, New South Wales, at latitude 32° 28' S, longitude 149° 51' E.

The slabs of shale covered with impressions of fossil leaves have been used to a limited extent as ornamental stone for interior decoration in new buildings.

The fossil bed is approximately 2 m thick. A coarse sandstone at the base of the bed contains impressions of many plant stems up to 25 cm in diameter. Above the plant stems is a hard blue-grey siltstone with few fossils. This grades up to a fine grey laminated shale which is packed with countless leaves of a number of *Glossopteris* form species. *Glossopteris conspicua* Feist. and *G. damudica* Feist. are the most common types with lesser numbers of *G. communis* Feist., *G. browniana* Brongn., *G. (?) mitchelli* Walkom, *G. angustifolia* Brongn. and other indeterminate glossopterid and gangamopteroid forms being present. Plants belonging to other classes are very rare. Species noted are *Phyllothea australis* Brongn., *Stellothea robusta* (Feist.) Surange and Prakesh, *Noeggerathiopsis* sp., *Sphenopteris lobifolia* Morris and *Sphenopteris polymorpha* Feist., including fertile fronds of the last-named species. Two thin coal seams overlie this bed.

GEOLOGICAL HORIZON

The above locality is in the Illawarra Coal Measures at the north-western edge of the Western Coalfield. The Permian and Triassic sediments in this area are almost horizontal and are unconformable with the Lower Palaeozoic basement (Dulhunty and Packham, 1962). An outcrop of the basement rocks occurs on the road leading to the quarry at approximately 45 m below the level of the quarry. The basal conglomerates of the Triassic Narrabeen Series cap the hill 55 m above the quarry. This places the locality just below the middle of the Permian sequence of the area.

Dulhunty (in Packham, 1969, p. 387) states that the coal measures in this area are regarded as equivalent to at least the upper sections of the Newcastle Coal Measures, which are Upper Permian.

The flora from this horizon can be correlated with the flora of the Baralaba Coal Measures and Blackwater Group of the Bowen Basin of Queensland (Rigby, 1972b), and the Raniganj Stage of the Damuda Division of Bihar, India.

* Hampden Hall, Kempsey, N.S.W.

SYSTEMATIC BOTANY

Division. Spermatophyta. Sub-division. Gymnospermae.

Class. Pteridospermae. Order. Glossopteridales.

Genus AUSTROGLOSSA gen. nov.

Diagnosis

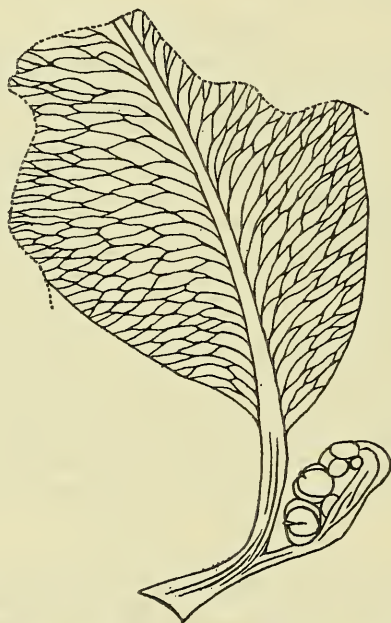
A female fructification of a cluster of platyspermic seeds on a pedicel adnately attached to the petiole of a *Glossopteris* leaf.

Type species *Austroglossa walkomii* sp. nov.

Text-fig. 1; Plate VI, fig. 1; Plate VII, figs 2, 3

Diagnosis

A female fructification of platyspermic seeds of the *Cordaicarpus* type; borne in a cluster on a pedicel adnately attached to the petiole of a leaf resembling in external form and venation *Glossopteris conspicua* Feist. Seeds not encased in a cupule or otherwise covered.



Text-fig. 1. *Austroglossa walkomii* gen. et sp. nov. Holotype. Specimen F55027. Natural size.

Description

Leaf type. The fertile leaves are variable in size and shape and are similar to sterile leaves with the same venation. The leaves are simple, petiolate, broad-ovate to narrow elliptic with obtuse or broadly acute apex. Length ranges from 7 cm to 15 cm and the width from 2 cm to 5 cm. The petiole is 1.5 cm to 2 cm in length and 2 mm to 3 mm in width and is usually marked with conspicuous parallel striations which continue through the length of the midrib. The leaf-base broadens to approximately 6 mm where it has abscissed from the main stem. The secondary veins emerge from the midrib at an angle of 20° to 30° and reach the margin at an angle of 45° to 80°. In specimens with very coarse mesh the secondary veins are not persistent from the midrib to the margin

but branch and fuse with adjacent veins to form open meshes which decrease in length towards the margin. The number of secondary veins at the margin varies from 8 to 20 per 10 mm and is usually double the number leaving the midrib.

Female fructification. The fructification is a cluster of platyspermic seeds of the *Cordaicarpus* type borne on a pedicel. The pedicel is from 2 mm to 10 mm in length and approximately 1 mm in width; adnately attached to the petiole midway between the leaf base and the lamina. In some specimens the pedicel is conjoined to the petiole so that the cluster of seeds appears to be attached to the base of the midrib. This is probably due to the pedicel being at right angles to the plane of the lamina at time of fossilization.

As many as 20 seeds are present in immature clusters, but on the majority of mature clusters only 6 to 10 seeds remain. The numerous single seeds found at this locality are very constant in size and shape, thus indicating that the seeds only became detached on reaching maturity.

The cluster is not enclosed in a cupule and the seeds have no covering or protective scales.

Seeds. The mature seeds are preserved as flattened discs 4 mm in diameter. A sarcotesta or wing 1 mm in width surrounds the nucellus except at the apex and base. A narrow acute projection 1 mm or more in length enters the apex of the nucellus as a result of sediment having entered the micropyle. On some seeds this projection continues as a fine ridge to the base.

The seeds are attached directly to a spindle-shaped receptacle, and on some specimens there is a suggestion of a spiral arrangement. Detached seeds bear a small scar at the emarginate base.

Occasional seeds have some carbonaceous material remaining in the nucellus, but maceration with nitric acid and potassium chlorate followed by an alkali has failed to reveal any details of structure or enclosed pollen grains.

Holotype. Specimen F55027. The Australian Museum, Sydney.

Paratypes. F51835 (collected by E. McCarthy) and F55029.

Locality. Kane's Flat, Cooyal, New South Wales.

Horizon. Illawarra Coal Measures, Upper Permian.

A Male Fructification

Specimen F55028 in the Australian Museum Fossil Collection has impressions of two *Glossopteris conspicua* Feist. type leaves with attached male fructifications. The leaf illustrated in Plate VII, fig. 6, has a cluster of sporangia borne on a pedicel attached to the petiole in a similar manner to the female fructification *Austroglossa walkomii*. The cluster of sporangia is oval, approximately 15 mm long and 8 mm wide. Numerous elliptical sacs 2 mm $\times$ 1 mm are attached to the axis at an angle of approximately 45°. Unfortunately no organic material is preserved to verify the male nature of this organ. However, I believe it will prove to be the male counterpart of *Austroglossa walkomii*.

Comparisons

Plumstead (1958a) described the female fructification *Pluma longicaulus* Plumstead as "looking like a bunch of rounded objects each 4 mm in size, lying slightly below the level of a dark oval patch 3 cm $\times$ 2 cm. The whole surface of this patch—round objects as well as intervening spaces—is covered by dark strengthening tissue, suggesting that the rounded seeds (?) were encased or covered. There is no sign of the axis on which they grew." The male fructification of *Pluma longicaulus* Plumstead and of a detached species, *P. thompsonii* Plumstead, have long arched axes from which hang a fringe of objects reminiscent of pollen sacs.

The *Cordaicarpus* type seeds of *Austroglossa walkomii* form a cluster on a spindle-shaped receptacle. At no stage of development of the seeds is there any indication that the cluster or individual seeds had any protective covering. The details of the male fructification attached to similar leaves to those of *A. walkomii* are not well enough known, but the compact oval cluster of sporangial sacs is in contrast to the feather-like appearance of the *Pluma* spp. It is possible that a relationship of family rank exists between the two genera, *Austroglossa* and *Pluma*, but proof of this must await discovery of better preserved specimens of both genera.

Rigby (1972a, p. 113) likens a specimen of *Arberia minasica* White to the male of *Pluma longicaulis* Plumstead, but I consider a relationship between these two fructifications to be extremely remote.

The form genus *Cordaicarpus* was proposed by Geinitz for platyspermic seeds, ovate or ovate-cordate in shape, with a cordate or round base and a narrow wing. The name, with its inference of Cordaitean relationship, is misleading. The choice between *Samaropsis* Goepfert and *Cordaicarpus* Geinitz depends only on the breadth of the wing (Seward, 1917, p. 354).

Many species of detached seeds have been described from the Upper Palaeozoic rocks of Gondwanaland (Walkom, 1921, 1928, 1935; Pant, 1958; Pant and Nautiyal, 1960; Maithy, 1964). Many of these have been associated with *Glossopteris* leaves, but none resembles the present seeds. A seed described by Arber (1902, p. 20) as *Cardiocarpus* sp. is similar in shape but much larger than the seeds of *Austroglossa walkomii*.

Discussion

Surange and Shrivastava (1957, pp. 47–49) drew attention to fructifications having been described as borne on certain species of *Glossopteris*. They pointed out the need to establish the true identity of the leaf on the basis of cuticular study, otherwise, as Shrivastava's work has shown (Shrivastava, 1957), the identification of a fructification-bearing leaf, based on external features alone, may be wrong to start with and consequently lead to wrong conclusions regarding the definition of the plant represented by these organs.

In shape and venation, the coarse-meshed form of the holotype of *Austroglossa walkomii* agrees with the illustrations of leaves of *Glossopteris conspicua* Feist. in Feistmantel (1881, Pl. 28A); Walkom (1928, text fig. 7); White (1966, Pl. B, fig. 2, and Pl. C, fig. 1); and Rigby (1972b, text fig. E and Pl. 1, fig. 6). Specimens referred to *Glossopteris conspicua* Feist. figured by Arber (1905b) and Du Toit (1927) appear to be different. The narrower leaf and finer venation of the paratype shown in Plate VII, fig. 3, resembles a leaf of *Glossopteris browniana* Brongn. figured by Arber (1905b, Pl. III, fig. 1).

Shrivastava's studies of cuticles (Shrivastava, 1957) demonstrate clearly the artificiality of the *Glossopteris* genus where species have been described with only their macro-characteristics being known. Shrivastava (1957, pp. 12–13) states "... a comparison of the fronds of *Glossopteris conspicua* Feist. and *Glossopteris formosa* Feist. shows that they differ externally only in their size, otherwise the form and venation is similar in both species ... the differences between their cuticles are not only sufficient to separate them specifically but also to warrant their inclusion in separate groups, perhaps of generic rank."

A leaf figured by Shrivastava (1957, Pl. I, fig. 3) was found to have an identical cuticle to specimens of *Glossopteris browniana* Brongn., yet on external characteristics Shrivastava suspected that it belonged to a different species. The external form of that particular leaf is very similar to some of the leaves to which the present fructifications are attached.

The possibilities are that *Austroglossa walkomii* could belong to *Glossopteris conspicua* Feist., *G. formosa* Feist. or *G. browniana* Brongn., and the correct identity of the leaf cannot be established until its cuticle is known.

Dr. E. P. Plumstead has examined the photographs illustrating this paper and has identified the leaf of the holotype as *Glossopteris conspicua* Feist. and suggested that the specific epithet *conspicua* should be used for this fructification. Dr. Plumstead thought the illustrated paratype (Plate VII, fig. 3) may be a different fructification and that the leaf might be *Glossopteris browniana* Brongn. However, at the Cooyal locality I have collected a series of leaves (some with fructifications attached) which grade from one form to the other. The difference in appearance of the seeds of this paratype is due to their immaturity. At this stage of development the seeds are more spherical in shape and are preserved in all orientations, whereas the mature seeds are always preserved in the one plane due to the seeds being flatter and the wing more developed. Seeds of both types are to be seen on the paratype specimen F51835. On one bedding plane there are numerous detached clusters of immature seeds, probably the result of storm damage.

Leaves identified on their macro-characteristics as *Glossopteris conspicua* Feist. have been recorded in South Africa from the Middle Ecca Beds at Vereeniging in Transvaal (Plumstead, 1952, 1958a), from the Upper Karoo Beds (Du Toit, 1927), and from the Orange River Colony (Arber, 1905). The bisexual fructification, *Scutum draperium* Plumstead, which is attached to the Vereeniging leaves, must be placed in a different family from the genus *Austroglossa*.

To avoid possible confusion at a later date when details of the cuticle of *Austroglossa walkomii* become known, I have not chosen a specific name alluding to a leaf type, but have named the fructification for Dr. A. B. Walkom, who was one of the first palaeobotanists to recognize that *Glossopteris* leaves belonged to seed plants.

Genus ERETMONIA Du Toit, 1932

Type species. *Eretmonia natalensis* Du Toit, 1932.

Generic diagnosis. As amended by Surange and Maheshwari (1970). Male fructifications, fertile leaves stalked, lamina thick, expanded, of various shapes, orbicular or roundly triangular, apex acute or rounded, lamina surface showing faint to distinct dichotomizing veins; two sporangial clusters, one on either side of leaf stalk.

Eretmonia cooyalensis sp. nov.

Text-fig. 2; Plate VIII, figs 8, 9

Diagnosis

Male fructification; fertile leaf stalked, lamina linear, venation dichotomous. Sporangia borne in two clusters, one on either side of leaf stalk. Each cluster comprised of approximately 12 sporangia arranged in a single whorl.

Description

Leaf lamina linear, 17 mm long $\times$ 3 mm wide; texture thin; no midrib. Three veins enter the leaf lamina from faint striations on the petiole. The veins fork once or twice and continue more or less parallel to each other to the leaf apex. No cross connections can be seen. Petiole 13 mm in length, tapering in width from 1.5 mm at the leaf base to 1 mm at the base of the lamina. Two distinct ridges run from near the base of the petiole to just below the lamina, where they diverge to become pedicels to which are attached the terminal clusters of sporangia. Pedicels 4 mm long $\times$ 0.25 mm wide. Approximately 12 sporangia arranged radially or spherically in a single cluster on each pedicel. Sporangia oval, 2.5 mm $\times$ 1.5 mm, pointed at each end and marked with faint longitudinal striations.

Holotype. Specimen F55031. The Australian Museum, Sydney, N.S.W.

Locality. Kane's Flat, Cooyal, N.S.W.

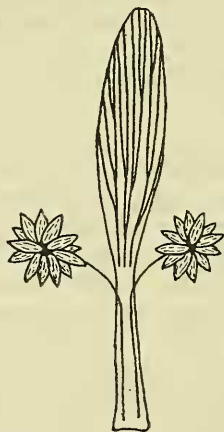
Horizon. Illawarra Coal Measures, Upper Permian.

Comparisons

Eretmonia natalensis Du Toit is a stalked leaf with a spatulate lamina. The distal end of the lamina was described as having a spoon-like depression in which Du Toit thought the sporangia may have been attached. His figured specimens (Du Toit, 1932, figs 10 and 11) show the sporangia disarranged at the side of the lamina. Surange and Maheshwari (1970) thought the spoon-like depressions were due to an act of preservation and they amended the generic diagnosis of *Eretmonia* Du Toit to contain a number of modified fertile leaves from the Raniganj Stage of India. No spoon-like depression is present on the Indian specimens or on the lamina of *Eretmonia cooyalensis*.

E. cooyalensis differs from the three species from India described by Surange and Maheshwari (*E. utkalensis*, *E. hinjradaensis* and *E. karanpurensis*) in having the sporangia in a single whorl to form the cluster on each pedicel. The sporangia on the three Indian species are arranged in several whorls in each cluster. They also differ in the shapes of their laminae.

Glossotheca utkalensis Surange and Maheshwari, a fertile leaf with several clusters of sporangia on a single pedicel, has a linear lamina similar to the lamina of *Eretmonia cooyalensis*.



Text-fig. 2. *Eretmonia cooyalensis* sp. nov. Reconstruction of holotype. Specimen F55031. $\times 2$.

Discussion

Eretmonia cooyalensis is described from only one specimen and its counterpart. It is preserved as an impression and is complete except for the top left portion of the lamina. The cluster of sporangia on the right-hand pedicel is disarranged.

This new species is placed provisionally in the genus *Eretmonia* Du Toit. It certainly belongs to the same genus as the three species from India. I suspect that Du Toit's specimens were similar to the fertile male scale leaves of *Glossopteris angustifolia* Brongn. described as *Lidgettonia australis* White (White, 1963, p. 392 ; Pl. XXII, fig. 1). A revision of this group of fructifications is desirable.

Detached sporangia associated with the *Glossopteris* flora were first recorded by Arber (1905a), who believed they were attached to scale leaves. Walkom (1928, Pl. XXXVI, fig. 4) illustrated a group of detached clusters of sporangia. Du Toit (1932) showed groups of sporangia in close association with a modified

leaf. Sen (1955) found that similar sporangial sacs contained pollen grains of the *Pityosporites* type. Surange and Maheshwari (1970) described three new species of *Eretmonia* and a new genus *Glossotheca* which demonstrated how these sporangia were attached to modified leaves. This type of sporangium belongs to the form genus *Arberiella* Pant and Nautiyal (1960). Because of their constant association with *Glossopteris* leaves, the *Eretmonia* and *Glossotheca* genera are placed in the Glossopteridales.

Detached sporangia and groups of sporangia occur sparingly at this locality. They resemble the sporangia attached to *Eretmonia cooyalensis* sp. nov. A detached intact cluster is illustrated in Plate VIII, fig. 10.

Genus DICTYOPTERIDIUM Feist. ex Zeiller, 1902

Type species. *Dictyopteridium sporiferum* Feist. ex Zeiller, 1902.

Dictyopteridium sporiferum Feist. ex Zeiller

(Plate VIII, fig. 14)

Three impressions of detached pitted laminae from the Cooyal locality are referred to this form species.

Description

Male fructifications; laminae elliptical, 35 mm to 60 mm in length, 10 mm to 15 mm in width; apex obtuse to broad-acute. The figured specimen, Plate VIII, fig. 14, has a short broad pedicel 2 mm long $\times$ 3 mm wide, but this feature is not present on the other two specimens. No visible venation. Oval pits 1 mm $\times$ 0.5 mm scattered irregularly over whole surface of lamina. Number of pits approximately 24 per 5 mm square. In those specimens where counterparts have been found, the surface of the counterpart is tuberculate instead of pitted.

Comparisons

Zeiller (1902, Pl. IV, fig. 8) shows a specimen from the South Rewah Basin which has the same arrangement of pits but is more elongated than the Cooyal specimens.

Feistmantel (1881) figured several specimens of this species from the Raniganj and Barakar Groups, some of which are said to have a reticulate venation and some have tubercles of a larger size along the margins. His specimen on Plate XXIII, fig. 14, is closest to the present material.

The outer covering of the fructification *Plumsteadia microsacca* Rigby as shown on the holotype of that species (Rigby, 1971, fig. 2a) appears to be a similar type of organ to the present specimens. White (1963, p. 395) suggested that *Dictyopteridium sporiferum* may represent the male half of this fructification, which is borne on leaves referred to *Glossopteris communis* Feist. This type of leaf is present in very limited numbers at the Cooyal locality.

Discussion

Rigby (1972b) gave a summary of all known specimens described as "*Dictyopteridium sporiferum*". Several different species seem to have been included under this name. The exact nature of these organs is not known due to the rarity of specimens and their poor state of preservation. I believe that they are the sporangiate organ of one type of plant bearing *Glossopteris* leaves, and I agree with Plumstead (1958a, p. 71) and White (1966, p. 51) that they should be included in the Glossopteridales.

Genus ISODICTYOPTERIDIUM Rigby, 1972b

Type species. *Isodictyopteridium walkomi* Rigby, 1972b.

Generic diagnosis

Linear lanceolate organ bearing numerous irregularly arranged, widely spaced, circular tubercles, superimposed on a fine longitudinal, occasional anastomosing venation that arches towards the margin and passes without interruption into the scalloped margin that surrounds the broadly pedicellate organ. Affinities unknown.

Isodictyopteridium costatum sp. nov.

(Plate VIII, figs 11, 12, 13)

Diagnosis

Organ of *Isodictyopteridium* type and having a prominent midrib from the base to the apex of the lamina.

Description

Male fructification (?); single detached oblong-linear lamina or several laminae radiating from a common point. Length 33 mm to 45 mm, width 8 mm to 10 mm. Midrib prominent, 1 mm or more in width, tapering slightly from base to apex. No visible venation. A smooth or undulate marginal thickening or wing surrounds the lamina. Circular or oval pits approximately 0.5 mm across are scattered irregularly over surface of midrib and adjacent areas but not on the marginal wing. From 10 to 20 pits occur in an area of 5 mm square.

Holotype. Specimen F55033. The Australian Museum, Sydney, N.S.W.

Paratype. Specimen F55034.

Locality. Kane's Flat, Cooyal, N.S.W.

Horizon. Illawarra Coal Measures, Upper Permian.

Comparisons

Neither *Isodictyopteridium walkomii* Rigby nor any of the specimens referred to *Dictyopteridium sporiferum* Feist. ex Zeiller possess a midrib. Except for this feature, *Isodictyopteridium costatum* may be compared with *I. walkomii* Rigby and the following specimens of *Dictyopteridium sporiferum* which have a marginal wing or border bare of pits or tubercles: White (1963, Pl. XXIV, fig. 12), Maheshwari (1965, Pl. 1, fig. 12) and White (1966, Pl. D, fig. 1). Another specimen figured by White (1966, Pl. D, fig. 2) has a bare margin, but the pits appear to be more closely spaced.

Discussion

No venation is visible on either the holotype or the paratype specimens, but this is probably due to the nature of the preservation. The two halves of these fossils are negative images of each other, *i.e.* one part shows pits, the counterpart shows corresponding tubercles. The illustration of the holotype shows the pitted face, and that of the paratype is of the tuberculate side.

Although the actual point of attachment of the three laminae on the paratype is missing, it is highly unlikely that this radial arrangement is accidental. Specimens arranged in this manner could not possibly represent the male half of a *Cistella*-type fructification as suggested by White (1963, p. 395).

In view of the rarity of these fructifications, it is noteworthy that two of the comparable specimens quoted above (Maheshwari, 1965; Rigby, 1972*b*) show two laminae in close proximity on the one slab.

I believe that these are male fructifications, probably belonging to a *Glossopteris*-type plant, and are modified leaves arranged in a similar manner to the clusters of sterile leaves of *Glossopteris* as described by Etheridge Jnr (1894) and Plumstead (1958*b*).

Genus *Glossopteris* Brongn., 1822

Type species. *Glossopteris browniana* Brongn., in part, 1822.

Glossopteris sp.

(Plate VII, fig. 7)

A number of specimens of an unusual form of *Glossopteris* leaf have been collected at the Cooyal locality.

Description

Leaves simple, variable in size, 4 cm to 8 cm in length, 2 cm to 3 cm in width. Lamina lobed at the base, occasionally without lobes when lamina is shortly decurrent on petiole. Leaf margin irregular, slightly scalloped and undulate, rarely entire. Petiole 10 mm to 15 mm in length, 4 mm to 8 mm in width; continuing into the leaf as a very broad midrib which tapers to the apex. Secondary veins in lower part of leaf leave the midrib at 70°–90° continuing in a straight or slightly arched course to the margin. At the base of the lamina the veins tend to recurve into the lobes; in the upper part of the leaf the veins leave the midrib at an increasingly acute angle. Secondary veins 15 to 20 per 10 mm form long and narrow parallel meshes. The whole surface of the petiole and the lower part of the midrib is covered with small rounded pits 0.2 mm to 0.5 mm in diameter.

Discussion

The leaves are variable in size and shape but the venation and pitting on the stout petiole and lower part of the midrib are constant features. The venation is similar to that of *Glossopteris ampla* Dana.

The pitting on the petiole and midrib may be the result of collapse of tissues during preservation. A remote possibility is that these were fertile leaves and the pits contained sporangia or pollen sacs. Dr. R. E. Gould has suggested that these leaves may have commenced growth as fertile organs, but due to a metabolic upset they failed to become fertile and resulted in this aberrant form.

At fossil localities where large numbers of *Glossopteris* leaves are preserved, an occasional leaf of most species may be found with the lamina having an acutely lobed base. The lobing appears to be the result of the decurrent portion of the lamina tearing away from the lower part of the midrib at some stage during the growth of the leaf.

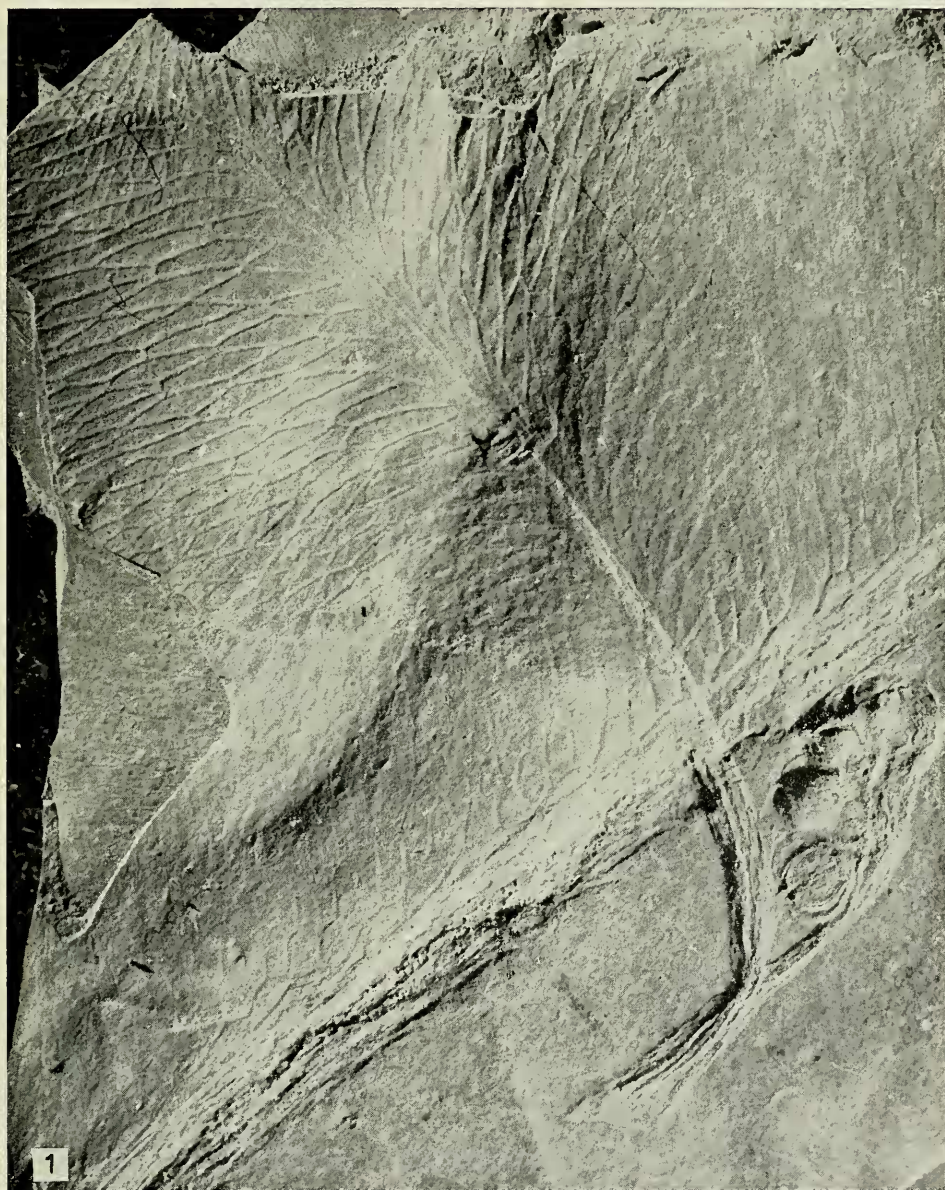
Glossopteris cordata Dana and a species from the Illawarra Coal Measures, *G. nephroedicus* Etheridge Jnr, have auriculate lower portions of their laminae. Du Toit (1932) listed *G. nephroedicus* as a synonym of *G. cordata*. He illustrated four specimens of *G. cordata* Dana. The venation is very open and coarse and is stated to be like *G. ampla* Dana or even *G. retifera* Feist. However, leaves which are referred to *G. ampla* Dana have fine elongated parallel meshes (see Walkom, 1922, Pl. 3, fig. 17; Rigby, 1966, Pl. 34, figs 41, 42).

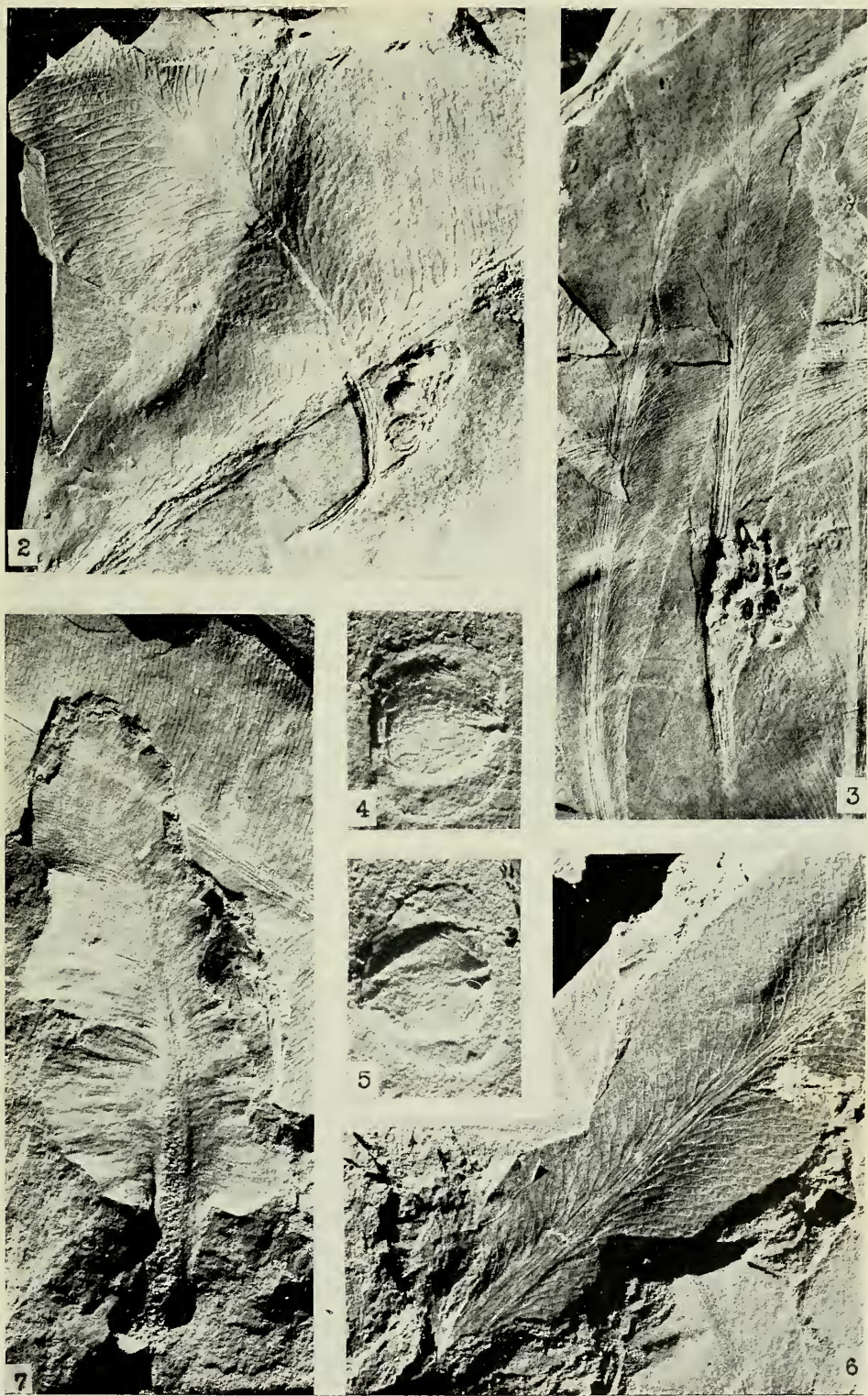
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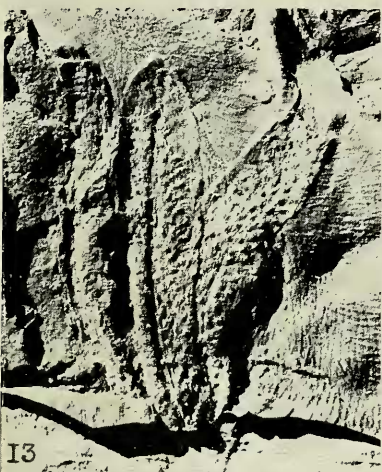
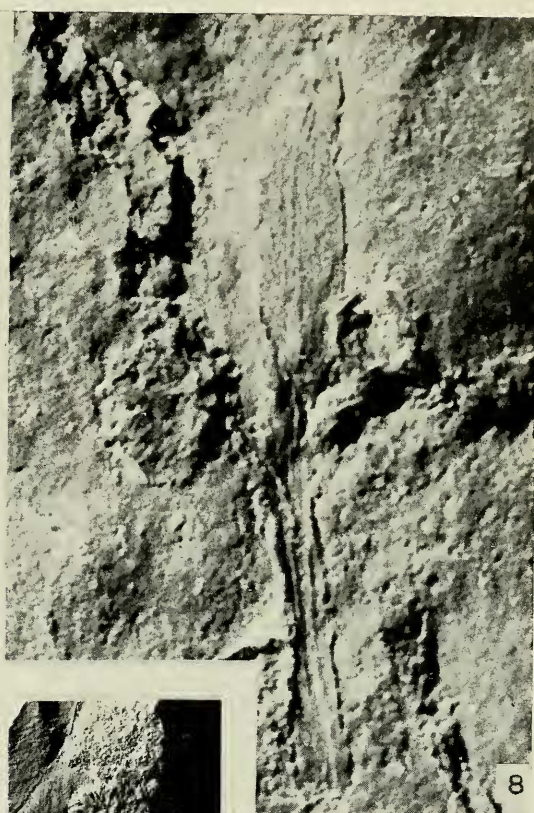
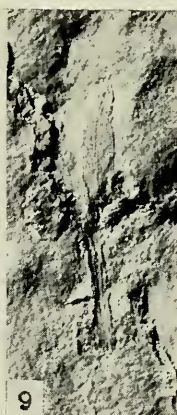
The author is deeply grateful to Dr. A. B. Walkom and to Mrs. Walkom for much assistance and encouragement. Thanks are extended to Mrs. N. Morris, Geology Department, University of Newcastle; Mr. N. C. White, Geology Department, University of Tasmania; Dr. R. E. Gould, University of New England; and Dr. J. Pickett, N.S.W. Geological Survey, for assistance in obtaining literature. Dr. E. P. Plumstead has read the manuscript and offered very helpful criticism and comments. Messrs. Babbage and Malone, of Cooyal, kindly gave permission for the author to enter their properties and to collect the fossil material.

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EXPLANATION OF PLATES

All illustrations are approximately natural size except where otherwise stated. The numbers shown are the registered numbers of the specimens in the Fossil Collection of the Australian Museum, Sydney, N.S.W.

PLATE VI

Fig. 1. *Austroglossa walkomii* gen. et sp. nov. Holotype. F55027. $\times 2$.

PLATE VII

Fig. 2. *Austroglossa walkomii* gen. et sp. nov. Holotype. F55027.

Fig. 3. *Austroglossa walkomii* gen. et sp. nov. A leaf with an attached cluster of immature seeds. Paratype. F55029.

Fig. 4. A detached mature seed of *A. walkomii*. F55030A. $\times 4$.

Fig. 5. A detached mature seed of *A. walkomii*. F55030B. $\times 4$.

Fig. 6. A cluster of sporangia attached to a *Glossopteris conspicua* Feist. type leaf. F55028. $\times 1.25$.

Fig. 7. *Glossopteris* sp. An unusual leaf.

PLATE VIII

Fig. 8. *Eretmonia cooyalensis* sp. nov. Holotype. F55031. $\times 3$.

Fig. 9. *Eretmonia cooyalensis* sp. nov. Holotype. F55031.

Fig. 10. A detached cluster of sporangia. F55032.

Fig. 11. *Isodictyopteridium costatum* sp. nov. Holotype. F55033. $\times 3$.

Fig. 12. *Isodictyopteridium costatum* sp. nov. Holotype. F55033.

Fig. 13. *Isodictyopteridium costatum* sp. nov. Three fertile laminae radiating from a common point. Paratype. F55034.

Fig. 14. *Dictyopteridium sporiferum* Feist. ex Zeiller. Six detached seeds of *Austroglossa walkomii* gen. et sp. nov. are scattered in the top right quarter. F55035.